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ASSOCIATION.

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PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.

A meeting of this Association was held on Wednesday, September 1, at the Manufacturers' Club in Philadelphia, the President, P. D. Wanner, of the Reading Foundry Company, Limited, Reading, Pa., presiding. As this was the first meeting after the usual summer recess, the proceedings were opened with

THE PRESIDENT'S ADDRESS.

"I deem it proper to assert that we meet this evening under more favorable auspices than at any time since our organization in 1891. We had to meet a lower and declining market shortly afterward and were compelled to battle against it in the best way we could. Many of us suffered seriously in both mind and body as well as estate during these years of depression and of tariff and silver agitation. We met from time to time under the most trying and exciting circumstances, and the hearts of many of us all but failed under the fear that there would be no future for the trade, if even for the country itself; but thanks to a kind Providence, gentlemen, we have passed the crisis. Patriotism, common sense and common honesty have been triumphant; the night is past and a glorious morning is about to dawn, bringing peace and quiet, prosperity and plenty to all the land. The tariff is adjusted upon

the best basis we could possibly hope for under our present political conditions. Free silver, etc., with their train of threatened evils, were defeated and followed by $1 gold wheat as against a 40-cent silver dollar. Our currency, though not entirely free from danger, is better and safer to-day than ever before; there is not a single condition, in my opinion, wanting at this time, with the ability to supply it, that would put the country into a more favorable position for business or enterprise. The man who now waits for better opportunities for either will wait to no purpose. The calamity howler's occupation is gone.

This country is producing 80 per cent. of the world's supply of corn, 70 per cent of the cotton, 50 of the wheat and more gold and silver than any other single country on earth. We have a corner on oil against the world and lead proud old England on iron after she has held the world's supremacy for so many years. In this connection I dare not forget our beef product and that of the great American hog. Our exports exceed the imports by nearly $200,000,000 per year, and we are making rapid strides toward securing our share of the world's trade, and with the adoption of a suitable system of protection to our merchant marine, we should soon be able to carry our own goods and have our ships plow the waters the world over and our flag float at the masthead in every port under the sun. We have a greater country and a greater people than we are aware of.

I predict that the volume of business during the coming era of prosperity will be simply enormous, though probably on a lower basis than heretofore as to values, profits and wages. Amidst all this profusion of greatness and glory I am sure that the foundrymen will be able to take care of themselves."

The Executive Committee, through Howard Evans, the secretary, then made the following report:

REPORT OF THE EXECUTIVE COMMITTEE.

"It is hoped that our members have had an opportunity to leave their shops for a short time to visit the mountains and the sea shore, in order that they may be prepared to struggle with the increased business that is promised us by the newspapers. As a

matter of fact, it is a question in our minds whether the newspapers have been entirely correct. We acknowledge that there is a better feeling existing in the different lines of trade, but it is a question in our minds whether the foundry trade has been benefited up to this date. If it has been benefited, we should like to know to what extent. Is there a greater demand for castings? And has there been any advance in prices? We know of a few foundries that are really very busy and have sufficient work to run them for several months ahead. But while this is the case we know of a great many other foundries, which compose the great majority, which have very little or nothing to do. Therefore, it is our purpose to-night to ask those who are present how they have been affected. At our last meeting in June there seemed to be a better feeling existing than there was in January or February. We want to know what the summer months have brought forth and whether the improvement is still advancing. The rapid advance in wheat, of course, has been a great boon to the farmer. This will mean a profit to those who did not sell before the advance, and will encourage them to the point of buying new machinery to assist them in gathering their future crops. It will mean the building of new cars and locomotives for the railroads, and increased business for a great many other interests which in the end will redound to the benefit of the foundry trade. It seems to us that we see in the distance the silver lining of prosperity in the dark cloud that has covered us for the last two or three years. We have nothing to do but to await the future. The above is respectfully submitted.

THE CONDITION OF THE FOUNDRY TRADE.

Reports as to the condition of the foundry trade in different sections were next received from members, as follows:

The Hanover Foundry & Machine Company, Hanover, Pa.: "We are very busy and have at this time as much work as we can get through with during the next three months. Our line is structural iron work and water wheels. We feel as though we were entering upon a solid and prosperous business era and hope our brethren in the trade can say the same thing."

Thos. Glover, Glover Bros., Frankford, Philadelphia, makers of hardware castings: "Things have improved somewhat during the last few months. Orders seem to come in briskly for a day or two and then fall off again, so I cannot say that we are busy. There is a little more inquiry, but as a general rule lower prices are expected."

Richard T. Bate, W. T. Bate & Son, Conshohocken, Pa.: "We run a very small foundry, but are running right along on orders coming in from day to day, but we have not much work ahead. We are not able to get better prices and cannot see that there is much improvement in the trade."

Mr. Oliphant, Trenton Malleable Iron Company, Trenton, N. J.: "Our business during the last two months has not increased in bulk, compared with the preceding months, but it shows a very decided improvement over the corresponding months of the preceding year. Our orders have fallen off somewhat during the last ten days, but we think the prospects for the future are exceedingly good. Prices have not advanced."

J. S. Stirling, Harlan & Hollingsworth Company, Wilmington, Del.: "We do not find much improvement and still have all we can do to keep our molders running."

A. V. Pessano, vice-president Geo. V. Cresson Company, Philadelphia: "As far as our work goes we have quite a quantity in hand and at fairly remunerative prices. We should, of course, like more, but we are not doing work for nothing. We are running about 300 men and have a large amount of work in prospect. If we get 25 per cent of the work we have figured on we shall probably have to run 24 hours a day."

Stanley G. Flagg, Jr., of Stanley G. Flagg & Co., Philadelphia, malleable iron founders: "Business at present is in quite a satisfactory condition, although in some lines it has fallen off a little. On the whole, business shows a decided step in the line of improvement."

W. H. Pfahler, Abram Cox Stove Company, Philadelphia: "Ours is a business dependent upon seasons. The general ap-

pearance of our trade all over the country warrants us in the belief that we can safely make up a larger stock of goods and we are running accordingly. We have to depend somewhat on cold weather, and there are conditions which affect our trade which do not affect others. We quite think that we are warranted in making up a larger stock than we have done for four or five years."

David S. Creswell, Eagle Iron Foundry, Philadelphia: "Business is improving. We are busier than we were at this time last year and prospects for the future are very good."

C. L. Prince, Camden Iron Works, Camden, N. J.: "Since our last meeting the condition of trade has improved a little. We are now running full in our shops, but in our green sand and loam shops we are not much ahead. Orders are coming in sufficiently fast at present to keep us going nicely."

Thos. Devlin, Thos. Devlin & Co., Philadelphia: "As far as we are concerned I may say that prices are no better, and in order to know whether we are doing better or worse we have to make comparisons. Taking the first seven months of this year compared with the same period of last year, I find that we are a fraction over 20 per cent behind. In August of this year we are about 10 per cent ahead of last year. These are facts as they appear on our books. The fact that August was a little ahead of last year would indicate that things are bettering. We are employing the usual number of hands, but are running short hours, and have been for over a year. I am of the opinion that the outlook is better. The fact that the farmer is getting better prices for what he has to sell, and that we are all working directly or indirectly for the farmers, leads me to think that in the near future we shall see better prices."

Mr. Deemer, Chester Steel Castings Company, Chester, Pa.: "We have been busier during the last three months than we have been for several years."

Mr. Davis, Crown Smelting Company, Chester, Pa.: "I think there is some sign of improvement in our business. We have been running five days a week all summer, but for the past week

or two orders have been coming in a little better and next week we may start in full time."

Mr. Ryder, Paul S. Reeves & Son, Philadelphia: "We are running on plenty of work in hand and are working overtime. This state of things is encouraging when compared with business at this time last year."

Brown & Sharpe Mfg. Company, Providence, R. I. (by letter): "We have nothing to say in regard to the foundry trade being better or worse, as we have had all we could do for the last two years, and have been obliged to have some of our work done in other foundries. Judging from the inquiries we receive and the sales we are making it would appear that the home market is improving considerably."

Mr. Williams, Enterprise Mfg. Company, Philadelphia: "We are working full time in all departments, with the exception of part of our foundry. Outside trade seems to be picking up."

P. D. Wanner, Reading Foundry Company, Reading, Pa.: "Our general foundry trade is better than it has been for the last few years, but prices are still very low. As to the cast iron pipe trade, it is too late for improvement to come this year. If the tariff question and other issues had been disposed of last year the pipe trade would have been good this year, but we cannot now expect much before next year."

I. R. Newkirk, of Wm. Wharton, Jr., & Co., Incorporated, Philadelphia, then read a paper on

"CASTING STREET GIRDER JOINTS TOGETHER."

The principal claims for this style of joints are:

1, a very stiff rigid joint; 2, the most practical way of increasing the life of partly worn out rails; 3, a saving in the cost of keeping up a good roadbed; 4, electric bonding of rails without any separate copper bonds.

The apparatus required for carrying on this work successfully is a good cupola with spouts and slag hole mounted with gimbal joints on a very strongly built wagon, that also carries within a

closed box an electric motor. This drives a fan supplying the required blast to the cupola through a pipe connected by a flexible connection, made necessary by the swinging of the cupola to a perpendicular position, that has to be provided for on account of the unevenness of the street grades. The charging of the cupola is exactly the same as used in ordinary foundry practice, there being no special physical or chemical requirements required for the metal beyond the fact that we have to use a strong mixture of iron and hot enough so that it will thoroughly amalgamate with the steel rails. We use coke entirely as fuel. Power is supplied from the overhead trolley wire by an insulated wire attached at one end to the motor through the rheostat, at the other to a special flat copper shoe, fastened to a pole which a man standing on the ground raises and hangs on the overhead trolley wire. The return is made through ground connection by wire fastened direct to the rails. A switch and automatic rheostat are used to stop or start the motor at the will of the operator. The shape or form of the mold is made by cast iron chills made in halves, which are set in their correct positions and held there by a clamp.

Early in the evening a gang of men start to clean and scrape the rails prior to putting on the iron chills. To do this successfully we find it necessary to use specially built heaters to dry the damp dirt, etc., that sticks closely to the rails and is very hard to remove. After this the rails are scraped and cleaned as bright as possible, this being necessary to make the iron amalgamate thoroughly with the rails. The rails are then surfaced and also lined up, then a screw clamp is put on, connected at each end by a clamp hooking under each rail, and a head piece is placed on the rails covering each end. The screw of the clamp is screwed down tight, thereby holding the rails in a properly adjusted position, while the iron is poured in on one side, amalgamating with the steel rails. After a mold is poured and a sufficient time has elapsed for the iron to set, the clamp and chills are removed and the same operation gone through again at another joint. We use an electric grinding machine for grinding the top of the head of the rails to an even surface.

The question of expansion and contraction has been a grave matter to deal with. This has been practically settled in the following way: The joints are generally made in warm weather when the rails are expanded to their extreme limit. At each end of a square, or say about every 400 feet, an expansion joint is made—that is, a joint which is not amalgamated with one end of the rails. Some railroad men prefer to have all the joints solid, so that when the rails contract in cold weather some joint, having been weakened by blow holes, due to rusty scale or any other cause, will break. The rails will then spread perhaps as much as two or three inches. The joint should then be broken off and a small piece of new rail set in and then a new joint made or cast on. This has been the experience in Chicago and elsewhere where the rails are subjected to extreme heat and cold alternately.

The expansion of the rail above the ground where it is free often has a tendency to buckle the rail sideways. In the street rail it is different, because the strong paving holds it in place. Therefore there is quite a compression at the ends of the rails, which keeps them from expanding to their full limit. The first winter is generally the hardest test for this style of street railroad construction. After the above repairs are made generally very little trouble is found.

The amalgamation of the iron and rails together usually gives a greater area to carry the current through than is given by the section of rail itself. In practical experience it is known that the large area of cast iron makes the joint much stronger than the rail, and when the tremendous contracting strain has been exerted the rails have broken and pulled apart at some point between the joists.

The Pennsylvania Railroad is now experimenting with 100 foot rails and the Lehigh Valley Railroad with 60-foot rails, and very many street railways use 60-foot rails, showing a growing tendency to have fewer joints to wear out and reduce the life of the rails.

The constant pounding of the wheels on the joints gradually wears an ordinary fish bar or joint plate down under the head of the rails. This in turn wears away the under part of the head of

the rail, and then follows the loose joint. To repair this properly we would have to fit a pair of joint plates to each special joint, which would be a very expensive operation.

We usually place the cupola, drawn by five horses, about one square away from the furthest joint to be poured, and carry the iron, that comes very hot from the cupola, back to the joint and gradually pour every one up to the cupola, and then as much past it as is found feasible. We then stop the motor and take off our feed wire and move the cupola to another position again, and start to melt as quickly as possible, always trying to avoid chilling the cupola any more than we can help. We have melted about 6,000 pounds per hour with our present cupola, of the Whiting Foundry Equipment Company's make. Owing to the small ladles into which the iron is tapped and the rapidity of melting, it keeps two men busy all the time tapping out and a gang constantly charging.

While the cast welded joint certainly seems superior to the fish bar joint, I do not think any actual comparative tests between the two have been recorded, therefore I am not prepared to state the increased length of life of the average run of rails at this time. The present electric traction cars are much heavier than the old style horse car, and wear out the rails much more rapidly and have a greater deteriorating effect on the roadbed.

In the discussion which followed the reading of the paper, the question of the amalgamation of the two metals was raised, and Mr. Newkirk said that there was no doubt in his mind that they united. That being the case the copper connectors or bonds for carrying the current from rail to rail were not required.

The contraction and expansion of the rails by changes of temperature was another interesting question, and Mr. Newkirk in response to inquiries stated that in Chicago where the extremes of temperature were greater than here, the contraction would occasionally pull the rails apart at the joint, and in one instance the rail itself had been pulled apart. The first winter generally develops these weak places, and they are repaired by inserting a piece of rail to fill up the gap, and welding it in place. The welding,

however, is not continued across the junction of streets, nor at curves and switches. At crossings an expansion joint, or slip joint, is placed which permits considerable movement of the rail longitudinally.

Chief Trautwine, of the City Bureau of Water, asked whether such a joint made a good electrical connection for the passage of the large currents flowing in the tracks, as, if it did not, much of the current would escape to the water pipes, to their detriment.

Mr. Newkirk replied that no copper bonds had been supplied to span these joints, and he did not believe there was any necessity for them. He did not know that any electrical tests had been made to show this.

No estimate of the cost of the process in comparison with the fish-plate method of jointing rails could be given; but Mr. Newkirk said that the greatest number of welds made in one night with a gang of 60 men was 102, which would give an idea of the labor and cost.

Mr. Pessano asked whether any of the members had data of any kind bearing upon the cost of a cupola lining per ton of iron melted. He had always used the best material to be had, and his records showed an average of $26 for 620 tons melted. The diameter of the cupola lined up was 43 inches.

A short discussion of this question closed the meeting.

A REVIEW OF THE FOUNDRY LITERATURE OF THE MONTH.

ALUMINUM WORLD.

In a paper read before the American Institute of Mining Engineers, by Edwin S. Sperry, on "The Influence of Lead on Brass," the author says:

Many authors recommend a slight addition of tin as beneficial in a free turning alloy, but its use is detrimental rather than otherwise; tin, as is well known, even in small amounts, hardens and increases the tensile strength of brass, qualities not sought for in a free turning alloy.

An analysis of a rod one-eighth inch in diameter, and found to be excellent for turning, gave the following results. The metal was manufactured by the maker having the best reputation for this line of work: Copper, 62.88; zinc, 35.03; lead, 2.09 per cent.

An analysis of clock brass made by another concern produced the following results: Copper, 61.36; zinc, 36.22; lead, 2.44; iron, 0.10 per cent.

AMERICAN MACHINIST.

Sept. 2. In an article on "The Mission of Foundry Facings" Henry Hansen says:

* * * Instead of helping to vent a mold, sea coal actually renders extra venting necessary. We know that the molding sand itself will produce a certain amount of gas, and if we now place an extra amount of gas producing material, such as sea coal, therein, does it not appear reasonable that more gas must be made than formerly, and that consequently we are compelled to provide increased facilities for its outlet? * * * Sea coal, like blacking or plumbago, is not used because it adds to the soundness of a casting; if it did, facing mills would be a great deal busier than they are. It is used simply to save labor in cleaning the casting, and nothing else. If a mold is not prepared right, and shows a tendency to scab or cut, all the facing that can be put in the sand

or on the surface of the mold is not going to prevent this. If a casting is heavy enough to fuse the sand, it will still be found that not a particle of this has entered the metal. In fact it is an old saying, that the roughest casting generally turns up cleanest. Foundries producing light work seldom use facing in any form, and the perfection of their castings, after they have passed through the tumbling barrel, is sufficient proof that sound castings can be made just as well without facing as with it. Not only are light castings equally well made without facing, but heavy castings made in loam or dry sand will prove sound and clean if molded without facing. I know some foundries have the habit of mixing one part of facing to fifty parts of sand for this kind of work, but the adding of this insignificant amount is merely from force of habit. Blacking alone, on such molds, is what peels the casting. * * * A suitable molding sand will largely do away with the necessity for facing. Some foundries are compelled to spend a considerable amount of money yearly for sea coal facing, which they could avoid by purchasing a better sand. Some shops are using facing sand consisting of one-seventh sea coal, where others on the same class of work are getting better results with heap sand. It all depends on where the shop calculates to make the saving. The mission of all foundry facings or blackings is simply to peel the casting and nothing more. They can neither improve the soundness of the casting nor the quality of the mold, though a misdirected application of them can injure both.

Sept. 9.—A. L. Bowen illustrates a method he adopted in turning out a gear wheel. To use a foundry phrase, the description is of an "emergency job."

Sept. 16.—R. D. Moore writes of "Skimming Castings," in which he says: * * * The process of skimming is simply passing the melted metal through a chamber long enough, wide enough and high enough, and consequently slow enough, to give time for the lighter dross to separate from the heavier metal by rising above it, and staying there. This separation takes place very rapidly if the metal is as hot as it should be for finished castings. * * * Some years ago a double gate—two small gates,

set 3 or 4 inches apart—was generally adopted as a skimmer; a small sprue running under the second gate being supposed to land all the dross in that small opening "quick as lightning"; but Nature don't work that way. All fluids in their passage through a pipe have their surface movements retarded by friction, which converts them into a series of revolving collars, as seen at the escape pipe of an engine. That operation may be called a good mixer; but for skimming fluid metal we need a good separator, a more placid passage, as through Lake Ontario, rather than Niagara's whirlpool. That double gate was, in a measure, a success; but the skimming was really accomplished by fast pouring, keeping the first gate very full, and floating the dross at the top. * * *

AMERICAN MANUFACTURER.

A correspondent requested the American Manufacturer to answer the following questions:

"What amount of silicon must pig iron contain to make a casting containing 1.5 per cent of silicon?"

"In smelting does the silicon rise or fall, and how much?"

The questions were submitted to a number of experts in foundry practice, whose replies are embodied in the following:

Mr. John Fulton, M. E., Johnstown, Pa., presents the results of some practical tests made by Mr. James H. Geer, assistant chief engineer of the Cambria Iron Company. The table compiled by Mr. Geer is given below. The first column gives the amount of silicon in the pig; the second the amount of silicon in bars, cast from these same pigs which were melted in crucibles and poured into sand molds:

Test no.	Name.	Grade.	Si. in pig.	Si. in casting.
1	Shelby	4	.90	.86
2	Muirkirk	4	1.70	1.20
3	Weybrooks	2	.55	.48
4	Napier	1	2.69	2.42
5	Hecla	4	.56	.37
7	Greenwood	2	.68	.62

8	Muirkirk	4½	.73	.60
9	Pinegrove	3	2.49	2.25
11	Muirkirk	4¼	1.35	1.08
13	Pinegrove	2	3.25	2.94
14	Shelby	2	1.36	1.04
15	Greenwood	4	.30	.10
16	Muirkirk	3	1.80	1.58

Mr. Fulton calculates from the above that the general average of reduction from the pig to the casting is 15.36 per cent. Test Nos. 2, 4, 9, 11, 13, 14 and 16 average higher in silicon, and the average decrease in the casting of these seven was 14.55 per cent. The lower silicon grades, namely, Nos. 1, 3, 5, 7, 8 and 15 show an average decrease of silicon in the casting of 18.55 per cent.

The high grade pigs (those marked 1 and 2 in the grade column) show an average decrease of 12.07 per cent of silicon from the pig to the casting. The low grade pigs (3, 4 and 4½) show an average decrease of 18.21 per cent. Mr. Geer states that in foundry practice it is usual to calculate a loss of 25 per cent in silicon from pig to casting. In this he differs somewhat from the opinion of Mr. J. M. Camp, chemist for the Duquesne Steel Works, Duquesne, who says:

"My experience in cupola practice has led me to think that the loss of silicon in melting iron is approximately a constant quantity (about .25 per cent) and not a percentage of the silicon contents of the pig. This, of course, is very dependent on the cupola practice. The above figure is for a continuous working cupola after it is hot, while on foundry cupolas, with their short runs, I think the loss would be higher at first till the cupola was hot and then approach the figure given above."

While, according to Mr. Geer, it is customary to calculate a loss of 25 per cent of the silicon from pig to casting, the results of the tests made by him indicate that this is rather high.

In commenting upon Mr. Geer's results, Mr. Fulton adds "As is well known, silicon is reduced in blast furnaces by a low heat, and conversely increased by high heat. The same law will dominate cupola practice. This will account for some of the varia-

tions in Mr. Geer's table, but not all. It will be noted that more silicon is reduced in the castings made from low grade pig iron than from the higher grades. From this fact I have assumed a loss of 20 per cent of silicon as a safe average in melting iron for castings in cupola work, such as is found in steel works. In ordinary foundry work the loss in silicon from pig to casting may come to Mr. Geer's estimate.

"When the variableness of the volume and pressure in a cupola are considered they will explain the variableness of silicon in the casting. The heat in a blast furnace, or rather, that of the metal from its crucible is 1500° C. and the heat in the crucible of a cupola is about 1200° C. It will be seen that the reduction of heat in the latter is 20 per cent."

Figuring on Mr. Fulton's estimate we have the following table:

Percentage of silicon in pig.	Percentage of silicon in casting.
1	0.80
1.5	1.20
2	1.60
2.5	2.00
3	2.40
3.5	2.80

According to Mr. Camp, the relative percentages would be as follows:

Percentage of silicon in the pig.	Percentage of silicon in the casting.
1	.75
1.5	1.25
2	1.75
2.5	2.25
3	2.75
3.5	3.25

According then to the first table the reply to our correspondent's inquiry, "What amount of silicon must pig iron contain to

produce a casting 1.5 Si.?" would be 1.87 per cent; according to the second table, 1.75 per cent. The second question is answered in both tables.

THE FOUNDRY.

Dr. R. Moldenke writes a paper on the "Analysis of Chill," from which we take the following:

To my mind, the next twenty years will find a remarkable change in foundry management. The superintendent or manager will be what he should be, an expert in everything connected with his work. He must be able to step into everyone's place, should occasion require it, that is to say, he must be fitted to be foreman, accountant, chemist, etc. While he will never be called upon to assume these places, it will enable him to properly control his working force and output, and in this way establish him as a money-maker for his employers.

Now, such a man, and he is the coming man for the place, can only be one who has acquired a thorough scientific training, not necessarily in a college, by any means, for life itself is a hard master, and the possession of the rare ability required by a good manager will push the man to the front whether he comes from the ranks or the universities.

Taking for granted, then, that the manager of a small foundry is as above described, what is to hinder him from employing a cheap analyst (not chemist), or have one of the office clerks look after the few silicon determinations that may arise daily, and he himself can make up his mixtures while sitting at his office desk. It is not necessary to pile up each car load separately, nor to make a complete analysis of this batch of iron. In handling some twenty thousand tons a year, I have not had more than a dozen complete analyses made, and some of the determinations used in the daily work represent three thousand tons of stacked-up metal. Such is the latitude a mixture should allow.

W. J. Keep, in his "Cast Iron Notes," answers the question, Is pig iron which is made in 1897 as good for foundry use as that which was made a few years ago? as follows:

The form of this interrogation indicates that the questioner is of the opinion that it is not. A founder will generally consider iron as not good if it is different from that which he has been accustomed to use.

One reason for a change is that ore from new mines is being used very generally, and that taken from old mines is of a different quality from that which was taken nearer the surface.

The chief reason for a change in the character of pig iron at this time is that the low price of pig iron has led many furnace managers to change their methods so as to get the greatest possible tonnage with the least labor.

To do this the volume and temperature of the blast is greatly increased, and the furnace is driven so fast that one stack is made to yield in some cases twice as much iron in a day as formerly with the same number of men.

It is a question whether in the long run furnaces which intend to make foundry iron will save money by this rapid driving. A furnace which is crowded is likely to produce a less uniform grade of iron.

The change in the character of foundry iron which perplexes the founder is, that iron which from the fracture appears to be of a certain grade is found to contain less carbon and silicon than he has been accustomed to expect in such a grade. In many cases the grading is less uniform than formerly.

The character of a casting is largely determined by the silicon which it contains. The amount of silicon necessary to produce a given softness and grain depends to a great extent upon the amount of carbon which the iron contains.

With less carbon more silicon is needed to produce a given quality. If more of the carbon is combined than formerly, more silicon is necessary.

With the present fast driving the iron produced contains less carbon, and a greater part is combined, and at the same time it contains less silicon than formerly.

Compared with former iron, more silicon is needed to produce a given effect upon the casting.

This silicon must be added by using an iron which contains a large amount of silicon.

The founder does not like to use such an iron because it costs more.

If iron is offered at a very low price and it is necessary to use with it a higher priced iron to get the silicon that the low priced iron lacked, such iron may not be cheap.

For these reasons the iron from furnaces which are run rapidly is not as desirable for foundry use as that from furnaces which are crowded less.

It would help the founder if those who continue to run their furnaces as formerly would advertise their iron as "old process" pig iron.

Many founders have learned to regulate their iron mixture by a measure of shrinkage, which is kept uniform by adding or decreasing silicon.

With low carbon the shrinkage will be higher and additions of silicon will not bring it down.

Those who regulate their mixture by chemical analysis are in a worse plight than those who use mechanical analysis, because they expect a uniform physical structure to accompany a uniform percentage of silicon.

With lower carbon the percentage of silicon must be increased.

If the fast method of running the blast furnace is to be permanent the founder must adjust himself to the new conditions, and before long the iron which troubles him now will be considered good iron.

The term pig iron does not represent a given composition, neither does the name No. 2 foundry iron indicate a definite kind of pig iron. Two irons may give the same chemical analysis and yet they will produce castings which have very different physical characteristics. Cast iron is a name given to a vast variety of compounds of iron with carbon and other elements. Each of these compounds are often so changed by conditions attending remelting or cooling or the size of the casting, that it becomes a new compound.

The founder should realize this, but it seems very difficult for him to do so.

Thomas D. West writes a paper on "Strength Tests," in the course of which he says:

* * * All founders and engineers should labor to the end of inaugurating a standard system of tests, and for which the writer advocates round bars having areas equal to one, two and three square inches, the latter two being for use in hard or chilled grades and the former in soft iron. It costs no more to adopt a bar which will indicate degrees in the strength of iron, to agree with its chemical composition, etc., than bars that cannot do so. The advocacy of any bar that cannot or is unsuited to indicate degrees in the strength of cast iron is only deterring advancement and making it more difficult for the attainment of standards or the possibility of founders and engineers making any intelligent comparison of their own tests with that of others. Bars much smaller than of one square inch section or area are too radically affected by the slightest variation in the dampness of molding sands and degrees in the fluidity of metal, to permit of any confidence being placed in any published records of their tests. Where light or stove plate founders possess a very careful test flask molder, they may if they want to be dead to the world in being able to make comparisons with others, and indifferent to whether they adopt the best method or not, use bars smaller than of one square inch area. Where is the sense of adhering to such small bars, when larger ones have every quality to recommend their use in preference to the one-half bars, and practically cost no more to adopt them? * * *

IRON TRADE REVIEW.

In an article on the "Composition of Southern Irons," dealing with its relation to the export trade, Wm. B. Phillips quotes some things, which are but too true, and we reproduce the article below, because we believe that the points the author notes with reference to the export trade should also apply to the home:

"It may, I think, be assumed that most of the pig iron exported from the United States this year will be of Southern origin.

The statement made in a previous article in this paper that the exports this year may be 250,000 tons was based on the fact that during the first six months of 1897 the shipments from Alabama alone were about 120,000 tons. At this rate this State will send out very nearly 250,000 tons herself. But allowing for a reduction in Southern tonnage, the exports are not likely to fall below 250,000 tons for the entire country. Just how much of the tonnage of the first half of the year was shipped on specifications as to composition is not known, but it is not probable that any considerable amount was sold under guarantee. The purchasers were glad to buy and there was not much evidence of coyness on the part of the sellers. There may have been, and doubtless was, more or less inquiry from abroad as to composition, but this point was not pressed, the general understanding being that the iron should equal certain well known brands of Scotch or English make. Southern iron producers are not without information as to the composition of their products, and, in some places a close watch is kept over the cast-house, and iron-yard. That they have been unwilling to enter into contracts based on the composition of their irons, except basic iron, has been due far more to their reluctance to introduce a new factor into the trade than to lack information.

"But there is one feature of the case that deserves careful consideration, and that is the effect of demands as to composition upon the regularity of the product. There is nothing like a good, wholesome pressure from outside to bring furnacemen up to the full measure of their powers. There was not a little hesitation when the first contracts for basic iron were undertaken, and one of the causes of this hesitation was the reflection that nothing of the kind had been attempted here before. It was a new thing that large contracts should specify the composition of the iron, giving maximum limits for silicon, sulphur and phosphorus. No one thinks of it now, for the venture was successful and nothing succeeds like success. But two years ago the idea was new, and did not meet with the favor it now enjoys.

"Now, aside from the production of this iron as a factor in the steel trade, there is another view of the matter that seems to me to

be even brighter and better. That is, the confidence that has been gained in the ability to handle irregular stock in the production of regular iron. The success with basic iron has done away with the belief that Southern furnaces could not make iron of uniform quality, and if now we hear complaints as to foundry and mill grades it is because consumers do not want uniformity and cheapness combined. It seems to be enough that iron should be sold at prices lower than those of any other district, although I for one can not regard it as an unmixed good that prices have been forced so low. But foundrymen and mill men are content to save in the price and take their chances as to quality. They do not stop to reflect that in many cases products offered at low prices must be sold at any price. In this lies the menace to the Southern iron trade, viz., the inability to turn the tide, to force prices up when they have for so many years been diligently forced down. Article after article has appeared to show the very low cost at which iron can be made in the South, and the writers did not stop to consider that they were doing an injury to the trade at large in impressing upon the market a belief that floods of cheap iron were about to be turned loose. Furnace after furnace was built, many of them so closely united to real estate "booms" that even at this distance and after the disintegrating effects of hard times, it can scarcely be told where the furnace began and the corner lot left off.

"Well, the mischief has been done, and if there be a remedy it will be found, not in an attempt to increase prices, but in the determination to better the product. It is not likely that we shall again see the high prices of 1887. The era of low prices, large sales and small margins has set in to stay, and we may as well make up our minds to face the situation. We may not increase prices, but we can always improve products, and a better product, if indeed, it does not command a better price, has at any rate the great advantage of holding its market.

"Perhaps the time has not yet come for insisting that ordinary grades of iron shall be destined for the steel furnace. We may, indeed, waive this point, and cheerfully allow that they should not be. But at the same time it is right and proper that ordinary iron

should not vary excessively in its composition. Take, for instance, No. 3F. A great deal of this grade and of No. 4F, has been sold for foreign delivery. It is in foreign markets that they meet with the severest competition, because the difference in the cost of laying them down there and the selling price there is less than in the home market. If there is any market to which the best goods should be sent it is where competition is most severe. We may get along in almost any clothes at home, but when we go abroad we must put on the best we have. No. 3F of Southern make is a very good iron, provided it is No. 3, and not some other sort masquerading in No. 3's clothes. If the silicon in normal No. 3 is two per cent, with an allowable variation of 0.25 per cent, above and below, what is the sense in grading as No. 3 an iron of over 3 per cent silicon, and in cases of nearly 3.75 per cent? I have known cases where 40 per cent of the iron, graded as No. 3F, over a considerable period, carried more than 2.50 per cent of silicon, and 16.5 per cent of it carried more than 3.0 per cent. In No. 4F, which may be allowed a variation of 0.25 per cent above and below 1.75 per cent, I have known nearly 64 per cent to carry more than 2.0 per cent of silicon, 30 per cent to carry over 2.50 per cent, and 20 per cent to carry over 3.0 per cent! That is, in the case of No. 4F, one-fifth of it had as much silicon as No. 1S should have, and nearly one-third of it as much silicon as No. 2F or No. 1F should have. In respect of the other ingredients there was no such marked discrepancies, and as the iron was supposed to be graded on its silicon content nothing further was required.

"Now, what can be said as to this state of affairs? The two irons were going into the home market and into the foreign market as well, and yet they were improperly graded, and did not fairly represent Southern irons of uniform quality. Certainly no one can claim that an iron with over three per cent of silicon is No. 4F, or any foundry grade. It is a soft iron and no matter what its color, fracture, strength, granulation or face it should never go out as anything but a soft iron. How can a steady market be obtained for iron subject to such variations in competition? Only by stress of circumstance; and on return of normal condi-

tions abroad it will be more and more difficult to maintain prices.

"The growth of the export trade in pig iron has been very great and very encouraging. It holds out peculiar inducements to Southern furnaces and has already relieved a serious congestion. But there is a side of it that can not be neglected if it is to continue its prosperous career. The iron must be inspected with the utmost care, and a uniformity of composition guaranteed and strictly observed. If the South is to fulfill its promises as one of the great iron and steel districts of the world it can do so only by insisting upon the application of the most stringent specifications as to the quality of its products."

MACHINERY.

J. McKim Chase, in an illustrated article on "Practical Patternmaking," describes different kinds of pattern work for molding in loam, taking for his subject standard castings, such as kettles and cylinders.

The following suggestions, taken from the paper, could be read with advantage by more than one foreman:

When giving out a job the foreman should express to the workman his opinion as to how the pattern should be made and molded, but he should also listen to and consider any suggestion made by the workman regarding it. Should the workman desire to make the pattern in a different way from that suggested by the foreman, and if a result equal in efficiency and economy can be thereby accomplished, he should be allowed to proceed in his own way, as he will then probably feel a greater interest in producing a good result.

Many good workmen consider it humiliating not to be allowed to use their own judgment as to the manner in which a piece of work should be done, and it is good policy not to altogether disregard their opinions unless they are manifestly at fault, but rather through an interchange of opinion arrive at a mutual understanding.

Men should be dealt with as men, and boys as boys, and not the reverse, which is sometimes attempted.

IRON MOLDERS' JOURNAL.

Thomas A. Haigh furnishes an illustrated article on "Bedding In," giving his views on this part of the molder's trade.

Charles D. Lyall gives a brief description of the molding and casting of the large steel gun recently made by the Otis Steel Co., of Cleveland, Ohio.

THE TRADESMAN.

E. H. Putnam writes the following on one phase of cupola practice, the subject being "Time for Charging the Cupola—Relative to Starting the Blast:"

Writers on this subject used to advise that the iron lie on the coke bed for an hour, or even two hours, before the blast is applied. They said that this would get the charge well heated through, and that it would have a tendency (one writer said) to anneal the iron!

The writers were capable foundrymen, and, therefore, their utterances must be respected, whether we indorse them or not. And I, for one, certainly do not indorse them. Pure iron is the desideratum. We cannot produce it in a common practice, but we strive to approximate it as nearly as possible. But, if you heat pig iron red hot, while it lies on the coke fire, it will very rapidly absorb the sulphur from the coke, and the sulphur will remain in the iron, causing the casting to be made therefrom hard and weak.

Again: Iron is annealed by being heated very hot and kept at a high temperature for a time, and then being allowed to cool very slowly. This is the simplest process of annealing by heat. It would seem to me to tax the imagination to some extent to believe that iron, kept red hot for an hour or two, then heated to the fusing point, and cast, would be annealed by the process.

I have tried all sort of plans in melting iron, and I believe the best plan for cupola practice is to charge so soon as the coke is well afire at all the tuyeres, and the blaze, or the red glow, may be seen next the walls when looking down the charging door; and so soon as the cupola shall have been filled, apply the blast.

In other words, the more quickly the iron goes through the cupola the better will be the product. I do not think that the molten iron takes up impurities so readily as red hot, or "mushy" iron.

Sometimes, when a pig of iron is heated red hot on a coke fire, and then removed, the strong sulphur smell is very marked. But this smell is not observed in melted iron. It is possible that the reason for this latter is that the sulphur in melted iron is chemically combined with the iron, and therefore cannot escape. But, in the case of the red hot pig, it had certainly been either chemically combined or else it had been collected and held within the iron mass, so that if the pig, in this surcharged condition, should be heated to the fusing point, it would seem reasonable to suppose that the molten iron would be likewise heavily surcharged with sulphur.

However this may be, my own experience indicates the propriety of charging the iron so soon as the coke is well afire at all the tuyeres, and then put on the blast when the stock reaches the charging door.

The important thing is to use the right kind of fuel—dry shavings, dry kindling wood, plenty of it, carefully laid in the cupola so as to insure a good draught everywhere; then light the fire at the tapping hole, and at all the tuyeres also, unless you have so intelligently arranged the fuel as to insure an even draught throughout the whole area of the cupola. Look into the tuyere holes frequently after lighting, till you see a perfect, hot fire everywhere. Then charge and blow as soon as you please.

The same writer says of the "Decadence of Mechanical Ability in the Foundry:"

* * * To harp upon the decadence of mechanical ability in the foundry may free the mind, but it does not improve the situation an iota.

The question is, why is the average of skill lower than formerly? There is no difficulty in finding the truth of a matter, if that is what we want. Most men have theories, legitimate children of their wishes, and spend so much time propping them

up that they miss the opportunity to learn. It is so easy to decry the man who has no means of defense. You and I may denounce that "gang of molders" for a thick-headed lot of incompetent numbskulls and we are justly entitled to whatever comfort the operation may yield. But didn't you and I have a confidential talk on the business situation in general, and on our own business in particular? Did not we arrive at the conclusion that this was the day of specialties? and that the specialist was the only man who could hope to keep above water during these stormy times? And didn't we have a strike in our shop, and didn't we hire a lot of inexperienced men who speedily became expert on their particular specialties? And now, when we turn them on to jobbing work we find that these men are—specialists, and not molders. But why should we act as if we were surprised at this? Why should we talk as if there were something that we had not expected? Why should we in discussing the quality of our "molders" ignore the fact that they are exactly what we deliberately and intentionally made them? For you know, we often have congratulated ourselves on the fact that they couldn't do anybody's work but ours, and so the danger of their leaving us or of their going out on a strike was reduced to a minimum. In short, if there is indeed any fault in the premises, is it not rather our own than the men's?

A prominent eastern foundryman at the Detroit convention last spring declared he had no sympathy for any employer who did not painstakingly educate his just quota of mechanics. The truth is, that the endeavor has been for years past, on the part of many employers, to prevent men from becoming good general mechanics, and therefore of course the average of skill has become greatly declined.

A good apprenticeship system, subscribed to by the operators and the molders generally, is the one thing absolutely necessary to the equilibrium of supply and demand in the matter of skilled molders. Custom formerly ruled in the educating of apprentices; but that custom has been destroyed and almost universally forgotten. And only a general agreement and concerted action can restore it. This, the American Foundrymen's Association, with the probable co-operation of the Iron Molders' Union of North America, will no doubt soon accomplish.